Develop and Implement Operational Ground Testing Protocols to Individualize Astronaut Sleep Medication Efficacy and Individual Effects

Completed Technology Project (2009 - 2010)

Project Introduction

The proposed pilot study provides an opportunity to test the feasibility of a protocol to use with astronauts and other NASA personnel (e.g., flight surgeons, flight directors, and flight controllers) to assess potential carry over effects from sleep medications used during spaceflight operations (including overseas training periods), and following an abrupt awakening from sleep. This information is critically needed to establish optimal and individually tailored usage of sleep medications by key personnel relative to operational demands. The proposed protocol is a feasibility study that will determine the percentage change in sleep inertia from using a medication compared to normal sleep inertia. Subject participants will each choose a hypnotic as their preferred sleep aid; once an appropriate medication is identified, each subject volunteer, in a controlled setting in the Crew Quarters Facility at Johnson Space Center (JSC), will undergo several awakenings during two nights of sleep (one night with the medication, another night with a placebo). Cognitive performance, using a set of three measures, will be evaluated at each awakening. This process will occur under the direction of the study Principal Investigator, a NASA Flight Surgeon.

Anticipated Benefits

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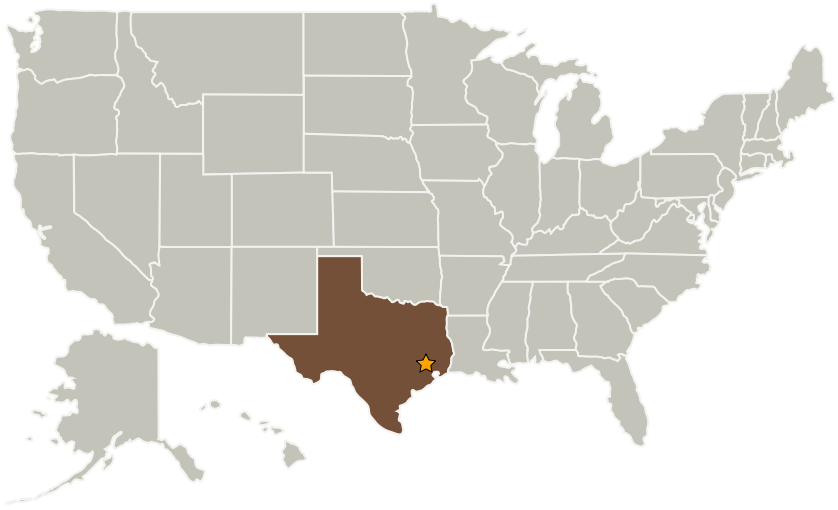
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Harvard Medical School	Supporting Organization	Academia	Boston, Massachusetts
University of Maryland, School of Medicine	Supporting Organization	Academia	Maryland

Primary U.S. Work Locations
Texas

Project Transitions

March 2009: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

Camille Shea

Principal Investigator:

Smith L Johnston

Co-Investigators:

Walter E Sipes
Charles A Czeisler
David F Dinges
Laura K Barger
Gary E Beven

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January 2010: Closed out

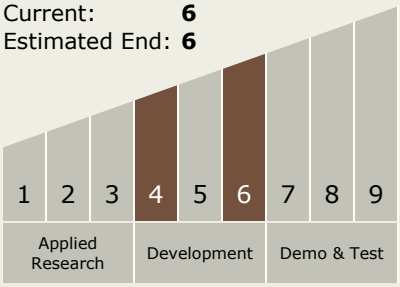
Closeout Summary: The study protocol was successfully pilot tested with N=7 subjects (6 NASA flight surgeons and 1 Behavioral Health and Performance elem ent Operations professional) as subjects from March through June, 2009. The pil ot study results supported the scientific feasibility of conducting a randomized, d ouble-blind, placebo controlled study of sleep medication effects on alarm-based awakenings. Preliminary analysis from the pilot study indicated differences in pe rformance upon abrupt awakening between the sleep medication and placebo co nditions. Thus, the pilot data also support the likelihood of new scientific and clin ical insights from the proposed Phase II studies with NASA astronauts.

Project Website:

https://taskbook.nasaprs.com

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.3 Behavioral Health and Performance

Target Destinations

The Moon, Mars